THE BRITISH JOURNAL

OF

OPHTHALMOLOGY

OCTOBER, 1941

COMMUNICATIONS

HEREDITARY OPTIC ATROPHY WITH DOMINANT TRANSMISSION AND EARLY ONSET

BY

J. GRAHAM SCOTT

GLASGOW

Review of Published Cases

CASES of dominant heredity with early onset have been reported by Batten,[1] Doyne,[2] Knapp,[3] Gunn,[4] Lawson,[5] Clemesha,[6] Posey,[7] Fisher,[8] Griscom,[9] Alsberg,[10] Herzog,[11] Isayama,[12] Thompson and Cashell,[13] and Riedl.[14]

In 14 families, there are reports of 83 cases of optic atrophy.

(1) *Inheritance.*—In almost every case the atrophy is directly inherited from an affected parent; from a male in 20 cases, from a female in 19 cases.

In two cases (Griscom's) the atrophy is passed on from an unaffected parent. In this pedigree, as in Thompson's, there is evidence of sex linkage.

In two pedigrees (Knapp and Alsberg) the atrophy is transmitted from a case of Leber's disease.

(2) *Sex Incidence.*—Of affected cases, 47 are male, and 36 are female.

(3) *Age of Onset.*—It is difficult to record the age at which early failure of vision occurs.

If one may assume that the presence of nystagmus indicates a congenital failure of central vision, 11 cases of the 83 are congenital, 25 are stated to be congenital. 30 cases are noted about school age, 9 are not known, and 8 are first noted between 8 and 12 years of age.

(4) *Signs and Symptoms.*—It is exceptional for the onset of blurring of vision to be noticed.

In few cases is there a history of any improvement or of any marked deterioration of the condition.

Except in Lawson's and Gunn's cases, both eyes are affected.

(5) *Fields of Vision.*

Recorded in 44 cases. Contraction of periphery in 22 cases. Central scotoma in 5 cases. Paracentral scotoma in 8 cases. Riedl finds examples of hemianopic and quadrantic colour defects.

(6) *Ophthalmoscopic Appearance.*

The fundus in all affected cases shows a pale disc with clear cut edges (the pallor being more marked on the temporal half).

In some cases the vessels are normal, and in others they are contracted. Deep cupping is noted in most cases. The remainder of the fundus is normal except in Griscom's cases where he notes some fine scattered retinal pigmentation.

(7) *Association with other disabilities.*

There is no association with other disabilities.

X-Ray of sella shows no enlargement.

In one case, a cellular shadow fills the sella. (Fisher.)

No case of abnormal adiposity, of diabetes, of hypo- or of hypergenitalism is reported.

Author's Cases

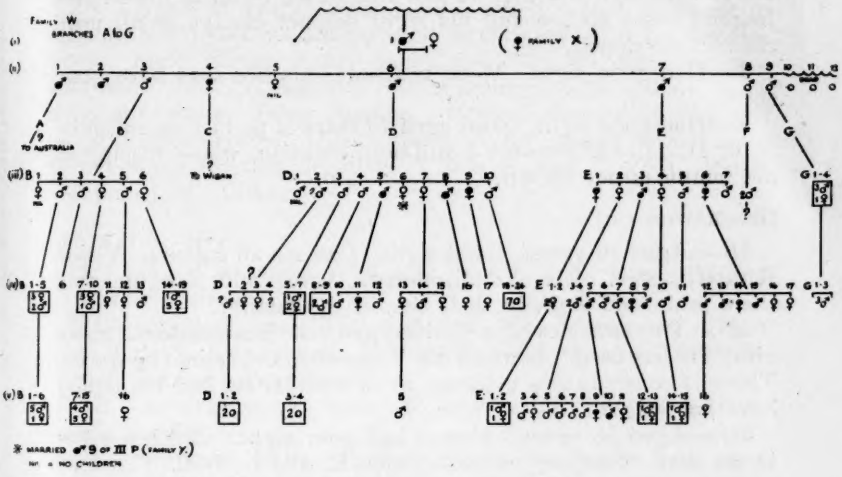
It is desired to record two families, totalling over 250 members, presenting 61 cases of optic atrophy. For convenience in recording, one family has been divided into " family W " and " family X "; the other is " family Y." The branches are called A, B, C, etc. Family Y is reputed to inter-marry.

The two families live in the same district, but no relationship is claimed. The individuals are healthy, industrious, long-lived, with no family defect other than optic atrophy.

There is no mental deficiency, or obvious endocrine dysfunction. There are no signs of specific disease and the Wassermann reaction is negative in 6 cases. No case with deafness or with loss of smell or taste is found. The causes of death present no significant factor.

I have seen 32 of the affected cases, 22 in their home, 8 as out-patients and 2 as in-patients in hospital.

The 10 hospital patients had a complete examination of C.N.S., 6 had blood count and Wassermann reaction test, 4 had X-Ray of sella and of sinuses. The 2 in-patients had a 24-hour urine test and C.S.F. examination. These tests showed no abnormality. I have also examined 37 unaffected members and find them normal.



FAMILY W.

Generation (ii) are all dead, but the wife of 9, Generation (ii) is alive, and is able to give me information about the parents Generation (i) with whom she lived for nine years.

No. 1 of Generation (i) was a preacher, and used to be able to read the Bible, but always had difficulty in recognising his friends in the street. Glasses did not help him. His wife was illiterate, but wore glasses and was able to see quite well. They were not related before marriage. There were brothers and sisters of whom she can remember little.

The same informant is able to give me the following information about the members of Generation (ii). This has been substantially confirmed by the members of Generation (iii).

GENERATION (ii).

1.—Always had poor sight. Went to Australia.

2.—Had poor sight and did not marry.

3.—Was an engine driver and had good sight.

4.—Had bad sight, and some of her children have poor sight, but they moved to Wigan, and cannot be traced.

5.—Had good sight but no children.

6.—Always had bad sight, which is confirmed by his daughters. Died aged about 70 years, and had diabetes in his latter years.

7.—Had bad sight, and stated that it was just the same all his life. He was able to go about by himself until the last three years, when cataract developed. He died aged 71 years of " old age." He stated frequently that he was able to see better at night. He found glasses no use and his sight did not change at all until cataract developed.

8.—Had good sight. Went to Crewe; his two sons have good sight.

9.—Had good sight. Died aged 40 years of pernicious anaemia.

10, 11, 12.—There were 3 still-born children, whose placing in the family is not known.

GENERATION (iii).

5*B*.—Aged 56 years. Good sight. Can see all colours. Vision R. and L. 6/9. J.1. Fundi normal. Agrees with daughter that there is no bad sight in their side of the family.

2*D*.—This case moved to Halifax, and little is remembered about him. He has been " bombed out " recently, and cannot be traced. There is contradictory evidence as to whether he and his family have poor sight.

5*D*.—Aged 58 years. Always had poor sight. Can see better in the dark. Sees no colours. Vision R. and L. 3/60. Can read less than J.20. Fields normal at periphery (tested by hand). Discs white, clear edges. No cupping. Vessels normal. Works as miner.

6*D*.—Aged 54 years. Vision R. and L. 6/9. J.1. All colours. Fundi normal. This was surprising as her children had atrophic discs. It transpired that her husband, who died aged 40 years of peritonitis, had always had bad sight. An investigation into the husband's family showed that hereditary optic atrophy of early onset was present. No relationship is known or can be established by inquiry. The children are shown in Pedigree Y.

7*D*.—Aged 52 years. Vision R. and L. 6/9. J.1. All colours. Fundi normal. Remembers father passing her in the street, and that his sight was always bad.

1*E*.—Aged 68 years. Sight always poor. Worse in last ten years with cataract. R. cataract removed when aged 64 years. Vision R. 4/60. Reads J.20. Vision L. Hand-movements. Disc R. white. No cupping. Edges clear cut. Vessels slightly narrow. No degeneration at macula. Disc L. cannot be seen due to cataract.

2*E*.—Aged 66 years. Vision R. and L. 6/9. J.2. Colours fair. Fundi normal.

3*E*.—Aged 64 years. Always had poor sight. First noted when

he went to school. Sight has not altered. Vision R. and L. 5/60. J.12. No colours. Fields normal at periphery. Discs white with deep cupping. Vessels normal.

4*E*.—Aged 63 years. Good sight. Vision R. and L. 6/9. Reads J.1. All colours. Fields normal. Fundi normal. Slight lens changes.

6*E*.—Aged 60 years. Poor sight. Noted before she went to school. Sight has not altered until recently, when it has become worse. Fields normal at periphery with 3/330. No central scotoma with 5mm./1000. (Great difficulty in seeing smaller spots.) Discs strikingly white. Deep cupping. Central nervous system and blood pressure normal. No deafness. X-Ray shows normal sella. Wassermann reaction negative. Vision R. and L. 2/60. Reads less than J.20. Colours —.*

GENERATION (iv).

11*B*.—Aged 36 years. Vision R. and L. 6/6. Reads J.1 and all colours. Fundi normal.

12*B*.—Aged 32 years. Vision R. 6/6. J.1. All colours. Vision L. 6/36. J.8. Few colours. Fundus R. and L. normal No strabismus. L. eye hypermetropic.

13*B*.—Aged 20 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

1*D*.—Supposed to have bad sight, but the family have been bombed out, and it has not been possible to trace them. 11*D* knows him, and thinks his sight is as bad as hers.

11*D*.—Aged 27 years. Sight has always been bad. First noted at school. Left school in standard 7. Vision R. 6/60. J.12. Colours x. Vision L. 4/60. J.20. Colours —. Discs pale with deep cupping on temporal side.

12*D*.—Aged 19 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

13*D*.—Aged 32 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

14*D*.—Aged 28 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

15*D*.—Aged 11 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

1*E*.—Aged 34 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

4*E*.—Aged 33 years. Vision R. and L. 6/6. J.1. Red-green blind. Fundi normal.

5*E*.—Aged 32 years. Always had poor sight. First noted at school. Vision R. 6/60. J.12. Colours —. Vision L. 4/60. J.20.

* Colour —, x, or xx, is explained in Table of Visual Acuity.

Colours —. Fields normal at periphery. Discs white with cupping. Remainder of fundus normal, except usual reflex absent from macula. Vessels normal.

6E.—Drowned at 7. Sight was good.

7E.—Aged 30 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

8E.—Aged 24 years. Always had poor sight. First noted at school. Enjoys reading novels. Vision R. and L. 6/24. J.8. Colours x. Peripheral fields normal. Discs notably white, more so in temporal half.

9E.—Aged 19 years. Has always had poor sight. Vision R. and L. 6/36. J.8. Colours xx. Peripheral fields normal. Discs grey-white. No bright reflex at macula. Vessels normal.

10E.—Aged 40 years. Vision R. +5·00 D. sph. +1·50 D. cyl. 135°. 6/12. J.2. L. +6·00 D. sph. 6/6. J.1. All colours. Fundi normal. Internal strabismus (only without glasses).

11E.—Aged 21 years. In R.A.F. Reports that vision is 6/6.

12E.—Aged 31 years. Always had poor sight. First noted when he went to school. Vision R. and L. 3/60. Less than J.20. Colours x. Fields, normal with 10/330 and 3/330 in periphery. Limited to 25° with 10/2000. To 8° with 6/2000, and to 3° with 4/2000. A 2/2000 spot could not be seen. The 4/2000 spot was seen more clearly away from the fixation spot.

Colours could not be recognised with 10/1000 spot, but with 10/100 spot red was recognisable at roughly 20° and tended to fade as it approached 0°. Fading was not confirmed with other colours.

Discs, pale with deep white cup extending to temporal side. Vessels normal. Wassermann reaction negative. Blood count normal. C.N.S. normal.

13E.—Aged 28 years. Saw well at primary school, but he found at seven that sight was poor (at secondary school), and had to sit in front. Left school at 14 in standard 7. Has been working as fitter's labourer, but could not accept promotion on account of difficulty in reading instruments. Has noticed no variation in sight. Vision R. and L. 6/60. J.8. Colours x. Fields, normal with 10. 3. and 1 mm. spot/330. Limited to 10° with 4/2000 spot, but 2/2000 spot not seen anywhere. The 4/2000 spot was seen as well at 0° as at 5° or 10°.

Colour fields are full in the periphery with 10/330 spot but cannot be recognised with 5/330 spot. There was difficulty in recognising a 20/1000 colour spot, but, with 20/600, colour was recognised more easily at 10° than at 0°. Red and green fields are similar, and both are greater than blue. Acuity of vision in the periphery is as good as that of two normal persons, as tested by minimum visible separation of two 3/330 white spots (5° apart, 45° out).

Discs grey, with deep white cupping. Remainder of fundus normal, but no normal reflex at macula. Urine: no albumin, and no sugar. C.N.S. no abnormality. Wassermann reaction negative. X-Ray: normal sella. Blood count 4,983,000 reds, 6,800 whites. Differential count: Polymorphs 52 per cent., Lymphocytes 43 per cent., Mononuclears 4 per cent., Eosinophiles 1 per cent., no Punctate Basophilia. Lumbar puncture, no increased pressure. Fluid clear. White cells 10 per c.mm. Protein 30 mg. per cent. no organisms. There was no hyperaemia of disc following puncture.

14*E*.—Aged 26 years. Has never been able to recognise friends in the street for as long as she can remember. Sat in front row at school. Had to come out to see the board. Glasses no help. Sight has not varied. Vision R. 3/60. J.20. Vision L. 3/60. J.12. Colours x. Peripheral fields normal with 3 mm./330. No central scotoma on Bjerrum screen 5/1000, but 1/1000 cannot be seen. No difference in shade of colour in periphery or centre with 20/1000, though colour not easily recognised. Fundus grey, with deep white cupping extending up to temporal margin. Edge clear cut. C.N.S. no abnormality. Wassermann reaction negative. X-Ray, sella within normal limits. Blood count: no abnormality.

15*E*.—Aged 23 years. Always had poor sight. Had to sit in front at school. Vision R. and L. 4/60. J.12. Colours x. Fields R. and L. slight peripheral contraction with 3/330. No central scotoma on Bjerrum screen with 10/1000, but 2/1000 could not be seen. Pupils react to light, but sluggishly on accommodation. There is a paresis of the right external rectus. He had diphtheria at the age of 7 years. Central nervous system presents no other abnormality. Wassermann reaction negative. Blood count normal. Discs grey nasal half, white temporal half, deep cupping. Vessels normal.

16*E*.—Aged 22 years. Vision R. and L. 6/9. J.1. Colours good. R. and L. fundus normal, but both present very deep physiological cupping. (Striking physical resemblance to mother who has optic atrophy.)

17*E*.—Aged 19 years. Vision R. and L. 6/6. J.1. All colours. Fields very full with 3 mm./330 white.

GENERATION (v).

16*B*.—Aged 3 years. Sight stated to be perfect. Disc R. and L. normal.

5*D*.—Aged 11 years. Vision R. and L. 6/6. J.1. Red-green blind.

1*E*.—Aged 4 years. Sight said to be good. Can see distant aeroplane. Fundi normal. Choroidal vessels visible in periphery.

2*E*.—Aged 2 years. Sight said to be good. Fundi no gross abnormality (undilated).

8*E*.—Aged 12 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

9*E*.—Aged 10 years. Poor sight. First noted when she went to school, when she had to sit in front. Now can sit a little further back. Vision R. and L. 6/24. J.1. Colours x. Disc R. grey, with normal cupping. Disc L. similar, with one spot of pigment near nasal margin. Normal peripheral fields for white 3/330. Fields for red and green 25°, and 10° for blue, on Bjerrum screen at 1 m. with 22 mm. spot. No central scotoma for white with 2/1000.

10*E*.—Aged 7 years. Poor sight. First noted when he went to school when he had to sit in front. Iris brown (from healthy mother). Vision R. and L. 6/36. J.1. Disc R. grey nasal half, deep cupping extending to temporal margin. Disc L. grey and pale, with normal cupping. Normal peripheral fields for white 3/330. Colour fields, 30° for red and green, 20° for blue on Bjerrum screen at 1 m. with 22 mm. spot. Reads the following Ishihara numbers:—

Correct: 12.8.29. 5.15. 2.97. 5.16.—.—.26.35.
R.: 12.8. 2.—.15.—.18.—.—.—.—.26.35.
Correct: 12.6.57.3.74.6.45. 7.73.—.—.42.96.
L.: 12.8.15.8.11.8.—.—.—.—.—.42.96.

11*E*.—Aged 4 years. Sight said to be good. Fundi R. and L. normal.

12*E*.—Aged 7 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal. Alternating strabismus.

13*E*.—Aged 4 years. Normal fundi.

14*E*.—Aged 12 years. Vision R. +5·00 D. sph. +1·00 D. cyl. 120°. 6/12. J.2. Vision L. +5·00 D. sph. +1·00 D. cyl. 120°. 6/6. J.1. Colour vision R. and L. normal. Fundus R. and L. normal.

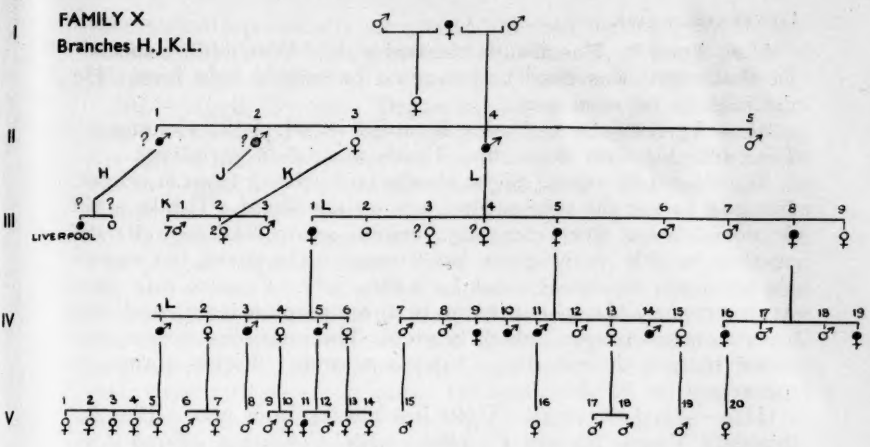
15*E*.—Aged 10 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

16*E*.—Aged 19/12. Can see aeroplane. There is no nystagmus. Disc R. very deep cupping. Temporal half of disc is pale, but within normal limits. Fundus L. normal. (Examined under atropine).

FAMILY X.

I am indebted to i) L of Generation (iii) (aged 74 years) for most of my information about generations (i) and (ii). Mrs. i) L states that her father and an uncle always had poor sight, and also her aunt in later life.

They all inherited it from her grandmother, whom she thinks was a sister or cousin of i) generation (i) of family W.



She states that branch H of the family have many cases of "the bad sight," but can give no details, and has lost touch with them.

She can give no information about branches J and K.

I traced the youngest son of K, who tells me that his mother's sight was good until she became old, and that none of his seven brothers or two sisters have poor sight, although he knows it runs in the family. His grandmother married twice, and was related to family W by birth.

GENERATION (iii).

H.—It is said that some members of branch H and their children have bad sight, but difficulties of travel have prevented further investigation.

3*K.*—Aged 69 years. Vision R. and L. 6/9. J.4. All colours. Fundi normal.

1*L.*—Aged 74 years. Vision R. and L. 4/60. J.20. Colours nil. Discs R. and L. white. No pigment changes. Vessels normal. Fields normal in periphery by hand.

2*L.*—Died young. Three and 4*L* are stated to have good sight.

5*L.*—Aged 61 years. Vision R. and L. 2/60. Less than J.20. Colours nil. Disc white with deep cupping. No change in vessels. Fields tested by hand, are contracted, but there is lack of concentration. Sight has not altered.

8*L.*—Aged 50 years. Always had poor sight. Passes husband in street, but can get around on her own. Vision R. and L. 4/60. J.20. No colours. Discs white with deep cupping extending to temporal border. Fields normal with 3mm. spot/330. No scotoma on Bjerrum screen with 5mm. spot at 1000. Cannot see 5/2000 spot.

GENERATION (iv).

1*L*.—Aged ?. Has always had bad sight. Was told by specialist that nerve was dead and that no one could help him. He declined to be examined.

3*L*.—Aged 40 years. Vision R. and L. 6/60. J.12. Colours —. Disc atrophic with deep cup. Fields normal in periphery.

9*L*.—Aged 34 years. Sight always bad. Sat in front at school, but had to ask the others what was on the board. Thinks sight is worse in last five years, *e.g.*, cannot see to read so well; she used to be able to recognise her friends in the street, but cannot do so now. Vision R. and L. 5/60. J.20. Colours nil. Disc very atrophic. Deep cup extends to temporal margin, and well over to nasal margin, which is grey. The arterioles crossing the nasal margin do not dip. Vessels normal. Fields normal in periphery by hand.

11*L*.—Aged 29 years. Sight has always been poor. Has not altered. Vision R. and L. 3/60. J.12. Colours x. Fundus R. and L. Pale with deep cup. Edge clear. Fields normal in periphery with 3/330 white. No scotoma with 5/1000 white, but 5/2000 cannot be seen. Colour fields reduced to 5° with 20/330 red and green, and to 3° for blue. Blood count normal. Wassermann reaction negative. C.N.S. No abnormality. C.S.F. Clear fluid, no increased pressure. Cells 5 per c.mm., protein 20 m.g.m., chlorides 780 m.g.m., no organisms. Wassermann reaction negative. Lange oooooooooo. No hyperaemia of disc after lumbar puncture.

13*L*.—Aged 24 years. Vision R. and L. 6/6. J.1. All colours. Fundus R. and L. deep physiological cupping. Very marked in left fundus.

14*L*.—Aged 23 years. Sight has always been bad. Vision R. and L. 3/60. Less than J.20. No colours. Field normal by hand. Disc white with cupping. Vessels normal.

15*L*.—Aged 21 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

16*L*.—Aged 24 years. Has always had poor sight. First noted when she went to primary school from the age of 5 to 11 years. She was then sent to blind school in case her sight should get worse. She is the only member in the two families who went to blind school. Her sight has never varied. Vision R. and L. 6/60. J.12. No colours. Discs R. and L. white, with deep cupping. No other abnormality. Fields very full with 3mm. spot/330. No central scotoma on Bjerrum screen with 10/1000. Could not see 2/1000.

17*L*.—Joined Army as A1. Sight presumed to be good.

18*L*.—Aged 18 years. Has always had good sight and has noticed no change whatsoever in either eye. Vision R. and L. 6/6.

J.1. Colours practically all correct but read haltingly by R. and L. eye. Fields by hand—normal. Fundus R. striking pallor of temporal half of disc with cupping. Fundus L. normal disc.

19*L*.—Aged 13 years. Began school aged 4 years. She happened to be seated near the board, and had no difficulty in seeing the letters until she moved to the " Big " school at the age of 12 (in September, 1940). She then found she could not see the board, but had previously noticed that her sight had begun to fail in the last two years (since February, 1939), when she was 10. Her periods began in April, 1940. On enquiry, it was found that she had annual tests at school, and she stated that she could read to the foot of the card until June, 1940, when she could only see the top three rows; also, she used to be able to recognise friends in the street, but about two years ago noticed she could not see their faces until they were close. On being asked if she had noticed anything else, replied " I used to be able to see the colour of my friends' dresses further off than I can do now." Vision R. and L. 6/24. J.2. Colours as follows:

Correct:	12.8.6.29.57.5.3.15.74. 2.6.97.45.5.7.16.73.—.—.—.—.—.26.42.35.96.
R.:	12.8.6.28.57.5.3.15.97. 8.6.87.46.3.4.16.23. 5.—.46.—.26.46.35.90.
L.:	12.8.5.29.57.5.8.46.97.13.6.67.48.6.7.46.—.—.—.46.—.76.—.46.—.

Discs: Pale temporal half, grey nasal half, with normal cupping. Vessels normal. Fields normal with 3mm. spot/330. No central scotoma on Bjerrum screen with 5/1000 but could not see 2/2000 spot. Central nervous system, no abnormality.

GENERATION (v).

1*L*.—Aged 20 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

3*L*.—Aged 16 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

4*L*.—Aged 14 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal. " Other two sisters have perfect vision " it is stated.

8*L*.—Aged 4 years. Appears to have good vision. Discs pale, but within normal limits.

11*L*.—Aged 8 years. Vision R. and L. 6/60. J.12. Colours xxxx. Fundus R. and L. bluey white temporal half of disc, nasal half grey. Normal cupping.

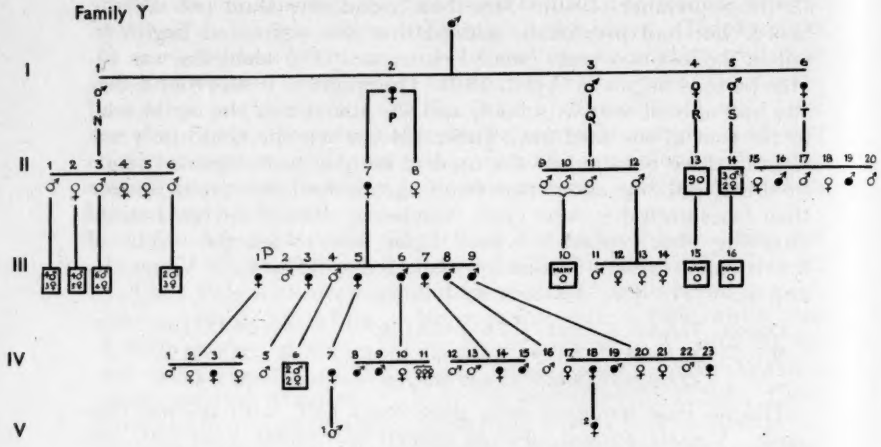
16*L*.—Aged 4 years. Fundi examined under atropine. Disc R. normal. Fundus presents few scattered spots of pigment. Disc L. pale, but within normal limits. No marked cupping. No bluish appearance.

17*L*.—Aged 2½ years. Appears to see well. Fundi could not be seen.

18*L*.—Aged 4/12 years. Can follow a light. No nystagmus.

19*L*.—Aged 9/12 years. Can recognise mother 300 yards away.

20*L*.—Aged 11/12 years. Fundi examined under atropine. Discs normal. Few scattered spots of pigment in periphery of fundus.



FAMILY Y

I am indebted to Mrs. W (5N of Generation (ii), aged 78 years) for most of my information about the earlier generations of this family.

Much of her information has been corroborated by Mr. W, the father of 7P, Generation (iv), who was in the same class as 19T, Generation (ii), and remembers the latter having to sit in front at school. Mr. W married 5P, Generation (iii), and remembers her relations well.

Mrs. W (5N) remembers her grandfather very slightly, but has heard her father speak of the former's poor sight, and that he could not get glasses to help him.

She remembers her aunts (2 and 6 of Generation (i)) who always had poor sight.

Her own branch of the family has no eye trouble, and she has heard of none in branches Q, R and S, where there are by now many relations.

13Q of Generation (iii) was able to confirm this, but was unable to say how many first and second cousins she had.

Branch T all went to America and have sent no news.

GENERATION (iii).

8*P*.—Aged 65 years. Always had poor sight, which ran in the family, and came from his mother's side. Vision R. 3/60. J.20. Colours +. Vision L. 2/60. Less than J.20. Colours —. Fundus R. atrophy of disc with cup. Vessels normal. Fundus L. cannot be clearly seen owing to lens changes.

9*P*.—Died at 40 of peritonitis. Married 6D, Generation (iii) of family W. His brother (8P) states that 9P always had bad sight, and his wife knows that he could get no glasses to help him.

13*Q*.—Aged 46 years. Sight has always been good, and states there is no bad sight on her side of the family. Her cousins have all good sight.

GENERATION (iv).

7*P*.—Bad sight noticed when she went to school aged about 4 years. She was able to see when seated in front at primary school, but was unable to see the board at secondary school where the boards are higher and not so well illuminated. She can see better outside at night. Thinks sight is somewhat worse in last three years. She taught for a few years at school, but was unable to read the children's writing. Vision R. and L. 6/60. J.6. Colours ++. Discs atrophic with deep cup. Vessels normal.

11*P*.—3 died young.

18*P*.—Aged 30 years. Always had poor sight. Vision R. 6/60. J.20. Colours —. Vision L. 6/36. J.12. Colours x. Disc R. and L. white with normal cup. Vessels normal. Fields normal by hand.

20*P*.—Aged 22 years. Vision R. and L. 6/6. J.1. All colours. Fundi normal.

23*P*.—Aged 17 years. Always had poor sight. First noted at school. Vision R. and L. 6/60. J.12. Colours x. Disc white with deep cup, more marked on temporal side. There is a spot of pigment on left disc. Fields normal by hand.

GENERATION (v).

1*P*.—Aged 4 years. Tested by his mother. Can see father at 300 yards. Sight supposed to be good. Fundus R. very deep cup and pallor of temporal disc margin. The nasal half is pink. Appearance is frankly suspicious. Fundus L. normal. Disc edges R. and L. clear cut.

2*P*.—Aged 4 years. Happy healthy child, full of vitality. Mother is sure her sight is good. Disc—blue-white, R. and L. more marked in temporal half. An attempt was made to test vision and colours. Both appear to be less than normal, but she can recognise her mother at 100 yards.

Discussion of Cases

(1) *Mode of Inheritance.*—In every case the inheritance is direct from an affected parent; from a male in 29 cases and from a female in 29 cases.

The following table illustrates the distribution in the two families:

	Inheritance from	
	Male	Female
Family W	17	4
Family X	5	10
Family Y	7	15
Total	29	29

There is no evidence of a sex-linked transmission.

In no case did atrophy develop from an unaffected parent.

In one case, an unaffected female of family W married an affected male of family Y. Their children were not affected more heavily than those of other branches.

These facts suggest a dominant autosomal inheritance from one parent heterozygous affected. On this point, the author's cases differ from some of the published pedigrees.

In the families, almost without exception, the colour of the iris is blue. It was wondered if the introduction of a brown iris from a healthy parent would affect the transmission. This is not so. Case 10E, Generation (v) inherits brown irides from his healthy mother, but inherits optic atrophy from his father who has blue eyes. It was also wondered if inheriting a strong family resemblance would carry the taint, but 16E, Generation (iv), who is a typical member of family W, has healthy eyes.

Cases 4E and 6E, Generation (iii), are identical in appearance, but only one has optic atrophy.

(2) *Sex Incidence.*—The following table illustrates the sex incidence in the affected branches:

	Affected		Unaffected	
	Males	Females	Males	Females
Family W	14	8	15	13
Family X	8	8	10	16
Family Y	10	13	13	13
Total	32	29	38	42

(3) *Age of Onset.*—As no case presents nystagmus, the onset is not congenital.

As the earliest atrophic disc is seen in a case aged 4, it is presumed that the age of onset is about 3 years of age.

In most cases, onset is not discovered until at Primary school (age 5) or, in a few cases, until at Secondary school (age 7).

One case (19L, gen. iv) gives a history of noticing onset at 10. Her brother (age 18) has noticed no change in vision (which is 6/6) but has one disc of more than normal pallor.

(4) *Signs and Symptoms.*—Thirty of the 32 cases seen were unaware of defective sight until it was discovered at school, when they had to sit in front. Most patients claim to see as well, or better, at night. A history of failing or improving sight is exceptional. Glasses do not help.

Common complaints are: (1) being unable to recognise friends in the street; (2) having to refuse promotion on account of poor vision. Only one case (16L) was educated at a Blind school.

No case is myopic and the majority have +1·0 or +2·0 D. of hypermetropia. Corrected visual acuity is recorded in the following tables:

It will be seen that the distant vision varies only slightly between cases aged 4 and cases aged 74. The reading vision shows a gradual change, but it is noticeable that the younger children can see remarkably well, and that there is little variation from 20 to 60 years. It is when we come to colour tests that the most notable differences are seen. Practically none of Generation (iii) can see any colours, but some in Generation (v) have normal colour vision, and all can distinguish bright colours with ease.

The colour test used throughout was that of the coloured numbers devised by Ishihara. The No. 12, composed of red dots on a bright blue background, presented difficulty to most. If the patient could distinguish no colours, he was marked —. If he could distinguish red and blue, but no number, he was marked x. If he could read No. 12, he was marked xx. If he could see a few of the following numbers he was marked xxx. Most numbers xxxx. All numbers xxxxx.

It was noteworthy that no case saw the " Blank " numbers, designed to be seen by the colour blind.

Two of the normal cases were found to be red-green colour blind, but the remainder had perfect colour vision.

Vision in the Dark.—Four cases were tested in a very poor light, and could see nearly as well as in bright daylight.

Pupil Reflexes.—In all cases (except one who has had diphtheria) pupils are circular and equal: they react briskly to light and on accommodation. Consensual reflex is present. There is no hippus. In no case is nystagmus found. The range of eye movements is full and normal.

(5) *Fields of Vision.*—Except in two cases, peripheral field of vision is normal. 10 cases tested with 3/330 Lister perimeter and 11 cases by hand. With the smallest visible spot it is not possible

TABLE OF CORRECTED VISUAL ACUITY in FAMILIES 'W.& X.' and 'Y.' arranged in corresponding generations.

GENERATION (iii)

Case No.	5D		1E		3E		6E		1L		5L		8L		8P	
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Snellen Type ...	3/60	3/60	4/60	@	5/60	5/60	2/60	2/60	4/60	4/60	2/60	2/60	4/60	4/60	3/60	2@/60
Jaeger Type ...	20	20	20	—	12	12	—	—	20	20	20	20	20	20	20	—
Colour	—	—	—	—	—	—	—	—	—	—	—	—	—	—	x	—
Age	58		68		64		60		74		61		50		65	

GENERATION (iv)

Case No.	11D		5E		8E		9E		12E		13E		14E		15E		3L		9L		11L		14L		16L		19L		7P		18P		23P	
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Snellen Type ...	6/60	4/60	6/60	6/60	6/24	6/26	6/36	6/36	3/60	3/60	6/60	6/60	3/60	3/60	6/60	6/60	6/60	6/60	5/60	5/60	3/60	3/60	3/60	3/60	6/60	6/60	6/24	6/24	6/60	6/60	6/60	6/36	6/60	6/60
Jaeger Type ...	12	20	12	20	8	8	8	8	—	—	8	8	20	12	12	12	12	12	20	20	12	12	—	—	12	12	4	4	6	4	20	12	12	12
Colour	x	—	—	—	x	x	x x	x x	x	x	x	x	x	x	x	x	—	—	—	—	x	x	—	—	—	—	xx xx	xx xx	xx	xx	—	x	x	x
Age	27		32		24		19		31		28		26		23		40		34		29		22		24		13		32		30		17	

GENERATION (v)

Case No.	14D		9E		10E		11K	
	R	L	R	L	R	L	R	L
Snellen Type ...	6/24	6/24	6/24	6/24	6/36	6/36	6/60	6/60
Jaeger Type ...	?	?	2	2	1	1	12	12
Colour	x	x	x	x	x x x	x x x	x x x	x x x
Age	4		12		7		8	

NOTE :—@ = cataract.

The signs used in denoting colour vision are :—

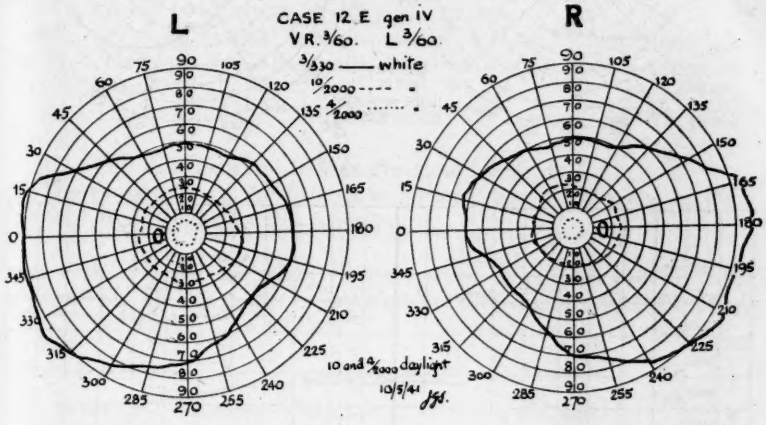
— = No colours.
x = Red and blue of (12) but can see no numbers.
xx = (12) but no other numbers.
xxx = (12) and some others.
xxxx = Nearly all numbers.
xxxxx = All numbers of Ishihara colour test.

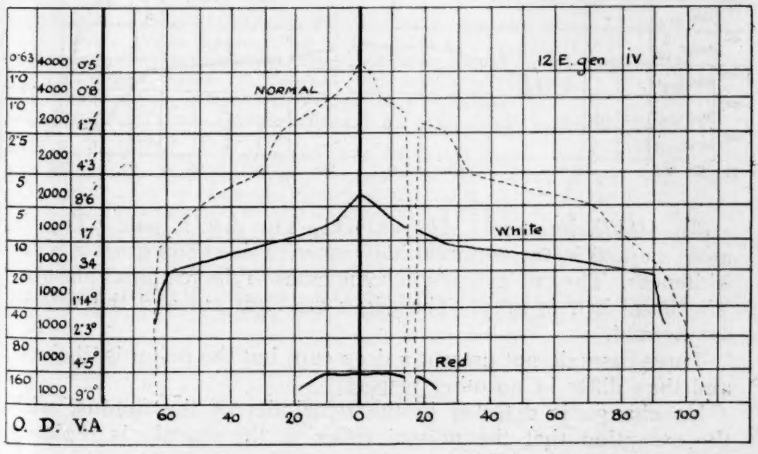
to demonstrate any scotoma which could be confirmed later. However, as the accompanying diagram shows, there is a scotoma involving the whole " peak " of the " hill of vision " (Traquair).[15]

Colour fields present a similar hill with larger visual angles, and there is an indication of an inverted tip at the peak of vision, but owing to the difficulty in recognising colours, this is not stressed.

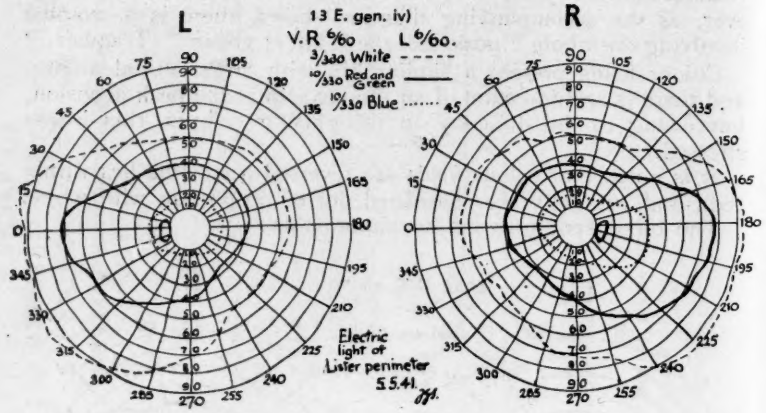
It is noted that colour fields are reversed (*i.e.*, blue lies within red), and generally are contracted out of proportion with white.

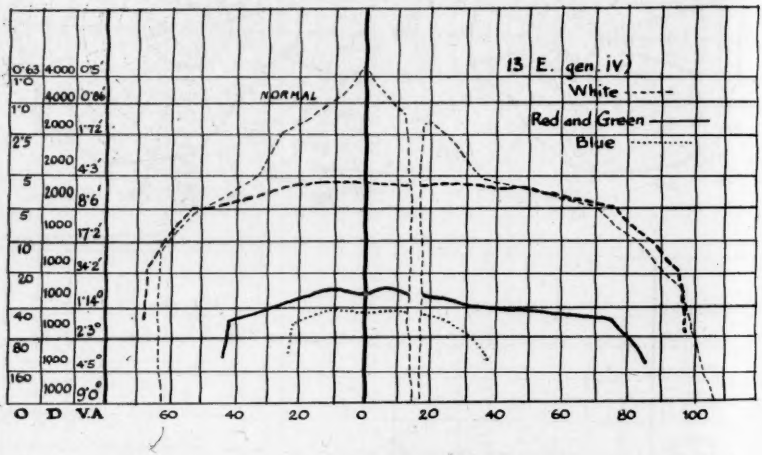
The blind spot presents no abnormality.





O.=size of object. D.=distance. VA=visual angle.





(6) *Ophthalmoscopic Appearance.*—The disc is pale. This is more marked in the temporal half, where a deep cup gives a blue-whiteness. The cup extends in some cases to the temporal margin. The nasal half is grey. The edges are clear cut and the vessels are normal.

Three cases do not present a deep cup, but the pallor is distinct, and they differ in no other respect.

No change is detected in the remainder of the fundus, with the exception that the normal reflex at the macula is replaced by a diffuse light reflex.

Apart from the degree of cupping, all affected discs are markedly similar.

(7) *Associated Disabilities.*—There is no association with any other disability.

Summary

Sixty-one cases of hereditary optic atrophy have been investigated and the following points are made:

(1) The inheritance is direct from affected male or female.

(2) 32 males and 29 females are affected.

(3) Onset is at about three years of age.

(4) Onset is gradual and unnoticed. Colour vision is not lost early. There is no subsequent deterioration or improvement of visual acuity.

(5) The base of the " hill of vision " is normal, but the peak is lost.

(6) The disc is white, edges clear cut, deep cup.

The remainder of the fundus is normal, bar the absence of the normal light reflex at the macula.

I wish to thank the Army for permission to publish this article, my colleagues at a military hospital for their help, and Professor W. J. B. Riddell for advice.

REFERENCES

1. BATTEN.—*Trans. Ophthal. Soc. U.K.*, Vol. XVI, p 125, 1896.
2. DOYNE.—Ped. 52, in Bowman Lecture. By Nettleship, *Trans. Ophthal. Soc. U.K.*, Vol. XXIX, 1909.
3. KNAPP.—*Arch. of Ophthal.*, Vol. XXXIII, p. 383, 1904.
4. GUNN.—*Trans. Ophthal. Soc. U.K.*, Vol. XXVII, p. 221, 1897.
5. LAWSON.—*Trans. Ophthal. Soc. U.K.*, Vol. XXVII, p. 169, 1907.
6. CLEMESHA.—*Amer. Jl. Ophthal.*, Vol. XXVII, p. 139, 1910.
7. POSEY.—*Ann. of Ophthal.*, Vol. XXIV, p. 423, 1915.
8. FISHER.—*Trans. Ophthal. Soc. U.K.*, Vol. XXXVI, p. 298, 1916; Vol. XXXVII, p. 251, 1917.
9. GRISCOM.—*Amer. Jl. Ophthal.*, Vol. IV, p. 347, 1921.
10. ALSBERG.—*Klin. Monatsbl. f. Augenheilk.*, Vol. LXXIX, p. 832, 1927.
11. HERZOG.—*Klin. Monatsbl. f. Augenheilk*, Vol. LXXXIV, p. 536, 1930.
12. ISAYAMA.—*Acta Soc. Ophthal. Japan*, Vol. XXXVIII, p. 144, 1934.
13. THOMPSON and CASHELL.—*Proc. Roy. Soc. Med.*, Vol. XXVIII, p. 1415, 1935.
14. RIEDL.—*Klin. Monatsbl. f. Augenheilk.*, Vol. XCV, p. 332, 1935.
15. TRAQUAIR.—Introduction to Clinical Perimetry.

The majority of the cases have been summarised by Julia Bell in Treasury of Human Inheritance, Vol. II, Part 4, 1931; and by Riedl (14).

THE HISTOLOGICAL INTERPRETATION OF APPEARANCES IN THE FUNDUS OCULI

A Scheme for Methodical Investigation

BY

A. J. BALLANTYNE

(FROM THE TENNENT MEMORIAL INSTITUTE OF OPHTHALMOLOGY, GLASGOW UNIVERSITY)

ALTHOUGH, as Duke-Elder has remarked, ophthalmology has had its period of intensive ophthalmoscopic investigation and its histological phase, and must now look for greater advances in the fields of bio-physics and bio-chemistry, we must admit that our knowledge of the normal and pathological histology of the fundus oculi is far from complete and still calls for a good deal of expansion and clarification.

We frequently remind ourselves that the ophthalmologist enjoys the privilege of being in the position to study, in the living state, the retina—an extension of the brain—and its blood vessels—an important part of the peripheral circulation, closely related to the intracranial, renal and other vessels. But these facilities are perhaps not employed as fully or as systematically as they might be, for the purpose of correlating ophthalmoscopic appearances with histological findings. The limitations of our knowledge in this field are shown by the continued use of a nomenclature of eye diseases based on faulty ideas of their pathology.

In our practice and teaching we are constantly under the necessity of interpreting the details of the ophthalmoscopic picture, normal or pathological, in terms of the structures which contribute to that picture; but, glancing over the field as a whole, it is surprising to find in how few instances we have unequivocal proof of the histological conditions represented by the ophthalmoscopic picture and of the pathological processes that have led up to them.

The ophthalmoscope has been in use for ninety years, with a steady advance in its design and in its capacity for revealing detail, while the resources of histological technique have enormously increased; yet, the two aspects have been, and still are, to some extent un-co-ordinated.

The achievement of valuable results in this field demands certain conditions which are not easily fulfilled. It is desirable:

1. That the fundus should be examined by every available method and that the detailed description of the fundus under such conditions should be supported by accurate drawings or photographs, and by careful measurement of the size and position of the structures or lesions under investigation. Microscopic identification of the actual lesion is most important, but it is usually

difficult, *e.g.*, when it comes to the examination of a small haemorrhage or a selected part of a selected blood vessel.

2. That the histological material should be obtained under the most favourable conditions as regards fixation and conservation of anatomical relationships, and that all appropriate histological methods should be employed in its investigation. Here also photographic and other records can be made and correlated with those already obtained at the clinical stage.

The number of cases in the literature in which these ideal conditions have been fulfilled is surprisingly small, and it must be admitted that the difficulties are great. There are, for example, many fundus lesions which do not lead to excision of the eyeball and in which the material can only be obtained after death from intercurrent disease. These may be discovered accidentally at post-mortem examination, and there may be no record of their ante-mortem appearances. In other eyes which have been excised on account of pain, or for other reasons, a preliminary ophthalmoscopic examination may be impossible through the presence of opacity of the optical media; or, the interval between an ophthalmoscopic examination and excision of the eye may be so long that the lesion in question may have completely changed.

To these handicaps we have to add the results of post-mortem changes which destroy or greatly alter the histological material, and the chemical destruction of certain substances, such as lipoid deposits, in the course of fixation and embedding.

In the Tennent Institute, with the aim of making the fullest use of the material which offers itself, the scheme here described is carried out as completely as each case allows. It is not claimed that the methods of examination referred to are new or original; but their employment in a definite sequence, and in the fullest detail, gives a completeness to the records which would otherwise be lacking.

I. Ophthalmoscopic Examination

It is not necessary to deal here with methods of ophthalmoscopy in any detail.

Indirect ophthalmoscopy, direct ophthalmoscopy with the electric ophthalmoscopes of Keeler, Hamblin, Curry and Paxton and others, and with the reflecting ophthalmoscope of Morton in conjunction with the sodium vapour and mercury vapour lamps, are our routine methods. The Cardell-Keeler polarised ophthalmoscope and the Holloway twin-beam ophthalmoscope are under trial, and have given various interesting results; but require further investigation. The binocular ophthalmoscopes of Gullstrand and of Franceschetti-Müller, and the Bausch and Lomb model, are also in use but have not been found of special value.

The method of intravitam staining, advocated by Sorsby (1937, 1939) (*a*) and (*b*) has not been employed so far, nor has examination or photography by infra-red light.

Since the "normal" ophthalmoscopic picture is a two-dimensional one, it is wise to cultivate those instruments and methods which help us to ascertain the depth relationships of the structures and lesions under observation. In direct ophthalmoscopy the relative depth of such lesions as exudates or pigment deposits can be estimated by their relation to normal structures, blood vessels for example, or to other lesions whose depth is known, such as striate haemorrhages in the nerve fibre layer. Parallactic movement of one structure in relation to another is sometimes useful.

Direct measurement of prominences or depressions by means of the ophthalmoscopic lenses is habitually employed in the estimation of a swollen disc or a glaucomatous cup; but in ophthalmoscopy we have no method comparable in precision with the Ulbrich drum of the corneal microscope or the micrometer adjustment of the microscope. Such measurements can be obtained at a later stage.

A very useful modification of the direct method is examination of the fundus under focal illumination. No doubt the most refined applications of this method are obtained with the apparatus of Zamenhoff (1930), Goldmann (1938-39) and others; but any electric ophthalmoscope which permits the focusing of a lamp filament or a point of light on the fundus, can give valuable results, especially when aided by controlled movement of the light image across the fundus.

So much for the ophthalmoscopic examination. There is a considerable gap between this and the histological examination as commonly understood. A broad no man's land lies between the ophthalmoscopist and the histologist; but this can be bridged by the employment of other methods. I shall refer here to two methods which fall in point of time, as well as in resolving power, between the initial ophthalmoscopic examination and the final examination of microscopic sections, and partake of the character of both methods.

The material for investigation comes to us from two sources. In the first place we have eyes excised from the living subject for various reasons. It occasionally happens that at the time of the enucleation the media are transparent and a verbal and pictorial record can be obtained of the fundus details. In the majority of cases this is impossible. The fundus may have been seen at some earlier period; but before the eye comes to excision there is usually so much opacity of the cornea, lens or vitreous, that ophthalmoscopy is impossible, and in the interval the state of the retina and other parts may have changed beyond all recognition.

It is otherwise in the case of eyes obtained in the post-mortem room. It is true that a great deal of valuable material is lost through lack of co-operation between the medical, ophthalmic and pathological departments; but where a proper liaison is maintained it is often possible to obtain accurate ante-mortem records to correlate with the post-mortem findings. In either case it is important to obtain, if possible, good illustrations of the fundus as a whole, or of important details. And here one may stress the inestimable value of coloured drawings made by one who is expert with the ophthalmoscope as well as with the brush. Fundus photography in black and white is usually a poor substitute, and even photography in colour leaves a good deal to be desired, although the beautiful examples shown by Bedell before the Ophthalmological Society (1937 and 1939) showed what can be done by the expert in this method. Photography at its best gives a faithful statement of the size, form and situation of a lesion, and is invaluable for serial illustrations of its progress. It is quick and less tiring to patient and surgeon. But the magnification is low and the finer details are often lost. A drawing, even a rough sketch, is often a more useful adjunct to a verbal description.

II. Slit Lamp Examination

For our present purpose specimens are fixed with formalin or some formalin mixture which preserves their transparency. Eyes excised from the living subject are placed directly in the fixing solution and are ready in 48 hours to be divided as convenient for the next stage of the examination.

In the case of the post-mortem material it is seldom possible to get permission for removal of the whole eyeball; but in every case where the skull is opened, the roof of the orbit can be removed, and the posterior part of the globe, with the attached optic nerve, excised after removal of the orbital tissues to the necessary extent. If the intracranial as well as the intra-orbital part of the optic nerve is to be removed, the roof of the optic canal must be chiselled away. In excising the posterior segment of the globe there is always a danger that the vitreous may escape, the sclera collapse and the retina become hopelessly detached. We have overcome this difficulty almost entirely by arranging that as soon as possible after death a few minims of ten per cent. formalin solution are injected into the eye through the sclera behind the ciliary body. If no post-mortem examination is allowed no harm is done, but when the opportunity occurs to obtain the specimen, it will be found to be in firm condition and when carefully removed the retina lies smoothly in position. In any case care must be taken in excising the specimen. With the subject in

the usual supine position the eye is looking upward. The exposed sclera is punctured by a very sharp worn Graefe knife and an incision with fine scissors carried round at or behind the equator of the eyeball. The vitreous will often be in the condition of a fairly consistent jelly and should be divided by the scissors at the same time. We should aim at keeping it in situ within the cup formed by the sclera. Before the scissors complete the scleral incision a small bottle (about 1 oz. capacity) filled with the formol

FIG. 1

Method of supporting optic nerve and posterior segment of eyeball during fixation. Both bottles are filled with the fixing fluid.

fixative is brought into position so that the optic nerve passes vertically into the bottle and when the scleral incision is completed the posterior part of the eye rests on the mouth of the bottle. In this way, spilling of the vitreous is prevented, and the retina kept in position. The small bottle with the specimen is then lowered into a larger tube or jar of the same fixing fluid (Fig. 1) and set aside for 24 hours before we proceed with the slit lamp examination. At this stage the vitreous must be removed. If it has a firm consistency and cannot be removed by irrigation it will be necessary to employ careful swabbing.

What follows applies equally to eyes excised from the living and to specimens removed after death.

It is necessary to have some form of holder to carry the eye under examination which will allow the specimen to be set in convenient positions and to " stay put." The carrier illustrated in Fig. 2 was made out of oddments but meets the requirements very well. It clips on to the forehead rest of the slit lamp stand, and an essential feature is the ball and socket joint, which formerly belonged to the " cat's whisker " of a crystal wireless set and

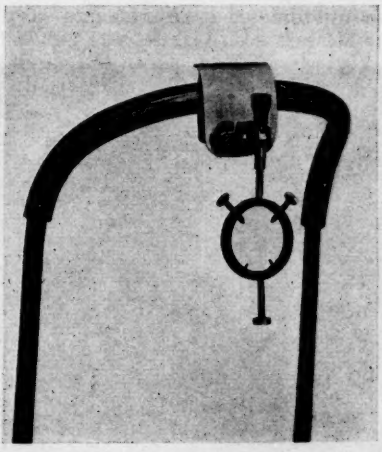


FIG. 2.

Appliance for holding the eye during slit-lamp examination. The sharp pins and adjustable screws grip the specimen. The ball and socket joint allows the eye to be placed and retained in any desired position.

allows of free movement of the specimen into any desired position. The eye is examined in the moist state, and it is unnecessary to place it under water until it is to be photographed.

The corneal microscope and slit-lamp give us a monochromatic view of the fundus, under magnifications of 9 to 35 diameters. In the normal eye the vessels are more or less completely filled with blood and the arteries and veins are readily distinguished from one another. The nerve fibre bundles can be easily followed. The macula presents its yellow tint and the margins of the depression are somewhat swollen. When it has been impossible, for the reasons already referred to, to make an ophthalmoscopic examination of the living eye, this slit-lamp examination provides an excellent substitute; indeed in most cases interesting features are revealed which evade observation with the ophthalmoscope.

The stereoscopic view and higher magnifications are an advantage; but much more important is the control over the direction of observation and of illumination. As in slit-lamp examination of the anterior part of the eye, we can employ the broad or narrow beam (the latter giving optical section) direct or indirect illumination, or illumination from the scleral side (retro-illumination) by the Gullstrand lamp or by any one of the familiar hand inspection lamps.

By this method we get a three-dimensional view of the fundus and can obtain micrometer measurements of the size, situation

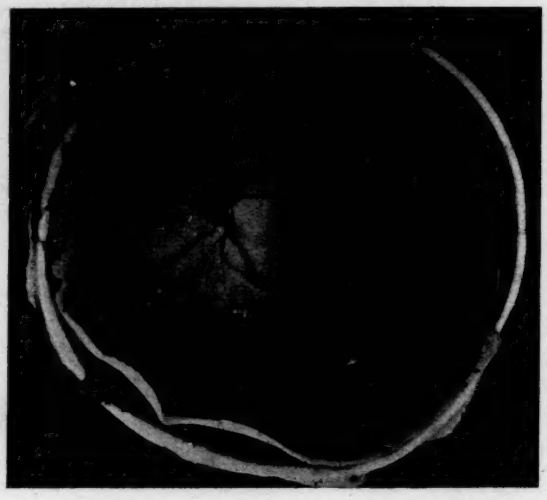


FIG. 3.

One of a pair of stereoscopic photographs of the posterior segment of the eye. Case of subhyaloid haemorrhage.

and space relationships of the parts, thus checking and amplifying our ophthalmoscopic records.

When the object of investigation is a small lesion such as a haemorrhage, an exudate, an arterio-venous crossing or the like, we select and locate it, measure its size and position and make drawings or photographs. In larger lesions we make stereophotographs under lower magnifications, of which Fig. 3 is an example.

III. Examination of the Retina in Bulk

The next step is the excision of selected portions of the retina. Having noted the lesion in question we punch out the affected portion of the retina by means of a three or four millimetre trephine

applied at right angles to the retinal surface and pressed against this with a slight rotary movement. If necessary a binocular loupe or dissecting microscope can be employed. The small disc thus outlined can be easily lifted with an iris repositor or fine forceps. It is placed in a watch glass containing water and transferred to glycerine on a glass slide and protected with a cover glass.

The microscopic examination in this form is in some respects an extension of the ophthalmoscopic and slit-lamp examinations; but employing higher magnifications. The isolated retina, without its pigmented epithelium, is seen by transillumination, and readily reveals such details as the nerve fibres and nerve fibre bundles, the pattern of Henle's fibre layer and of other tissue elements not so fully understood, the mosaic of the rods and cones and the perforations of the external limiting membrane, the structure of the vessel walls, the relationship of arteries and veins at their crossings and the pattern of the capillary plexuses. The resolution of these and other details is assisted by the stopping down of the substage diaphragm and the occasional movement of the mirror. The micrometer indications on the fine adjustment of the microscope enable us to measure the depth relationships of normal and pathological structures with a degree of refinement which is impossible in the ophthalmoscopic and even in the slit-lamp examination.

For most purposes this stage of the examination may be completed without staining or other treatment; but some investigators, notably Shaw Dunn in Glasgow and Friedenwald in Baltimore, have employed the examination of retina " on the flat " in conjunction with scarlet red or sudan staining for the lipoids, and in the Tennent Institute Professor A. Löwenstein has elaborated and modified the technique in many ways and with fruitful results. It lends itself especially to the demonstration of the retinal capillary plexuses, both in their natural state and by the injection and staining method described by Michaelson and Campbell (1940). Naturally, the specimens at this stage also lend themselves to illustration by drawing and microphotography.

IV. Final Stage

When the possibilities of this method of examining the trephined discs of retinal tissue have been exhausted the specimens are passed through the usual stages for embedding in paraffin, and serial sections are cut for further study.

Having followed the selected lesions through the earlier stages, and having kept note of the appropriate measurements, it is not difficult to identify these in the microscopic sections. Figs. 4 to 11 show some examples of the " follow up " from one stage to another.

The eye from which these figures were taken was excised on account of acute glaucoma. Ophthalmoscopic examination was very imperfect on account of the corneal oedema, but there was extensive haemorrhage, chiefly between the vessels, with a notable blood-free zone of varying width between the haemorrhages and the vessels. Fig. 4 was a diagrammatic indication of this appearance. The vein was full and tortuous with some variation of calibre, the artery very narrow and in parts opaque. Slit-lamp examination of the posterior segment did not reveal any greater detail. A circular disc of retina, including the lower temporal vessels, was removed by trephining and mounted in glycerine without staining. Figs. 5 and 6 show the low and high power microscopic appearances and their correspondence with the ophthalmoscopic picture. The veins are not so uniformly injected as in the living eye and the arteries are for the most part represented by solid white lines. Two kinds of haemorrhages are distinguishable—the striate (A) and the punctate (B) in Fig. 6. The blood-free zone is not so sharply defined as is the pale lateral sheathing due to opacity of the vessel wall; but it is more obviously

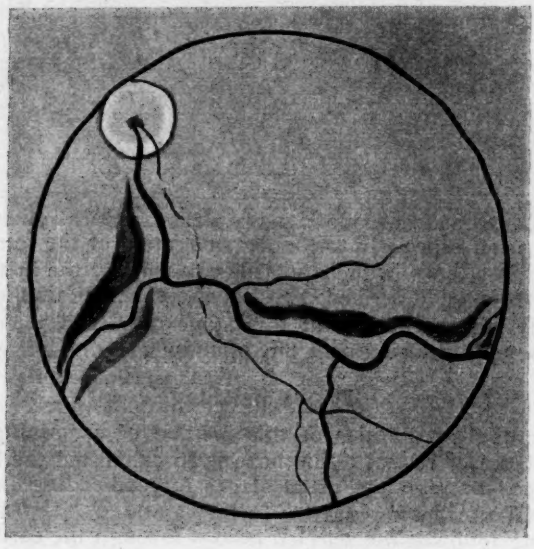


FIG. 4.

Ophthalmoscopic examination. Case of angiosclerosis and hyperpiesis with acute secondary glaucoma. Distribution of haemorrhage in relation to retinal vessels. Semi-diagrammatic.

FIG. 5.

From same eye as Fig. 4. Selected piece of retina removed by trephine and viewed microscopically on the flat, unstained. Vein accompanied by broad blood-free zone. At some points there is narrow white sheathing due to opacity of the vein wall.

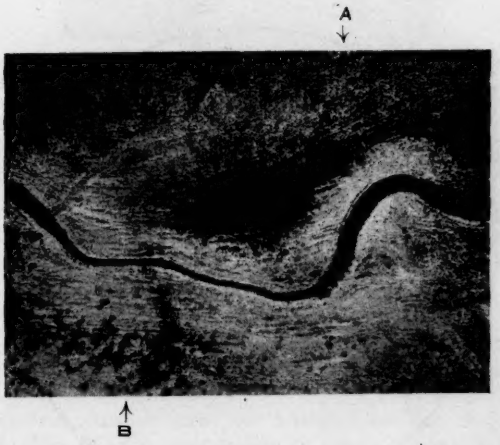


FIG. 6.

Part of Fig. 5 under higher magnification. Retinal nerve fibres outlined by effused blood. Superficial, striate, haemorrhage at (A) and deep, punctate, haemorrhage at (B).

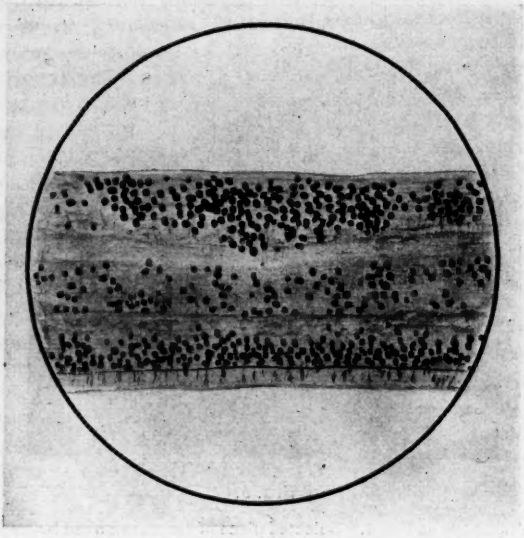


FIG. 7.

Paraffin section at part of retina shown at (A) Fig. 6. To demonstrate situation of striate haemorrhage in nerve fibre layer.

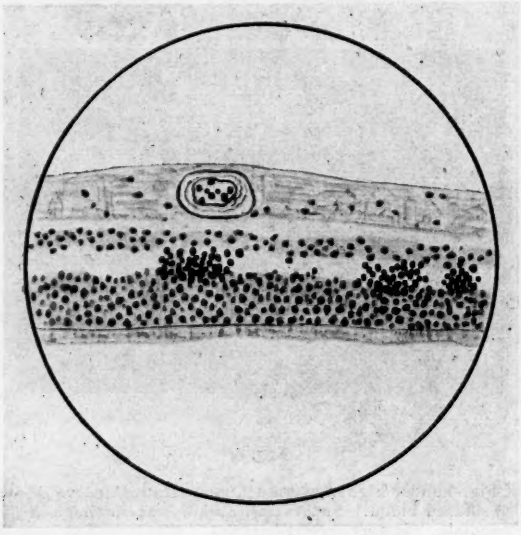


FIG. 8.

Paraffin section of part of retina shown at (B) Fig. 6. To demonstrate situation of punctate haemorrhage in outer molecular layer.

related to the course of the vessel where the haemorrhage is of the striate variety. The micrometer of the fine adjustment of the microscope indicated that the punctate haemorrhages lay some 50 μ deeper than the striate, and the sections taken from this piece of tissue after embedding in paraffin show that the striate haemorrhage is confined to the nerve fibre and ganglion cell layers (Fig. 7) and the punctate haemorrhage to the external molecular layer. (Fig. 8.)

Fig. 9 represents a more peripheral piece of the retina prepared in the same way. At (A) the retinal haemorrhage is separated from

FIG. 9.

From the same eye as Figs. 4 to 8. Retina at periphery, removed by trephining and seen on the flat, unstained. At (A) the superficial haemorrhage is limited by the opaque vessel wall. At (B) the vessel is largely concealed by haemorrhage.

the vascular blood column by a narrow, well-defined, blood-free zone, while at (B) the vessel is largely concealed by blood. Fig. 10 shows that at (A) the haemorrhage is confined to the inner layers and the narrow pale zone or bilateral sheathing is entirely due to the vessel wall. The concealment of the vessel at (B) is seen in Fig. 11 to be due to haemorrhage in front of and behind the vessel.

Other sections showed that the blood-free zone illustrated in Figs. 4, 5 and 6, is also most typically found when the haemorrhage is confined to the inner layers (striate haemorrhage) and is separated from the blood vessels by a variable interval. The reason for this " avoidance " of the vessels has not been determined,

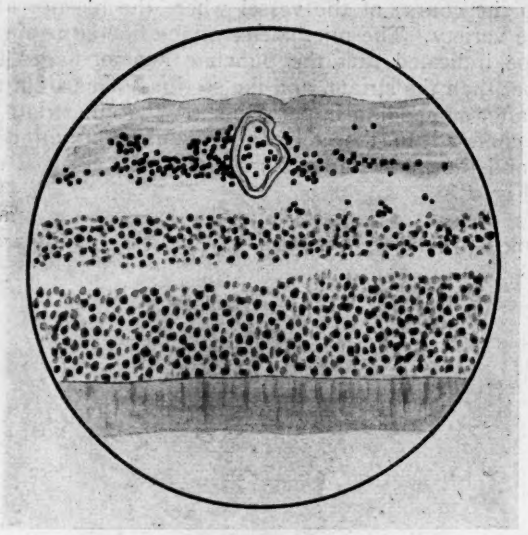


FIG. 10.

Paraffin section of retina shown in FIG. 9. Vessel and haemorrhage as seen at (A).

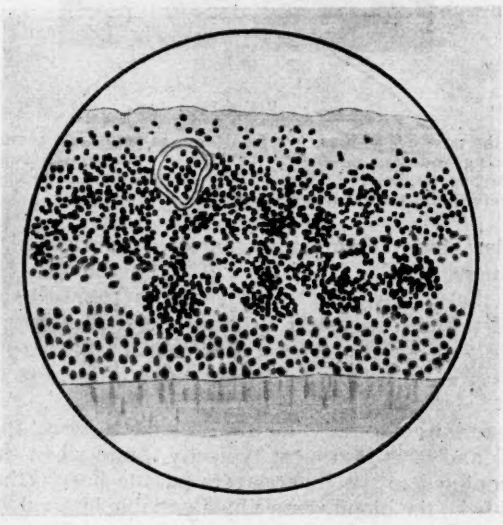


FIG. 11.

Paraffin section at retina shown in Fig. 9. Vessel and haemorrhage as seen at (B).

but in some cases this haemorrhagic pattern is very obvious. If one considers these pictures in conjunction with some of those illustrating the paper of Michaelson and Campbell (1940) the resemblance between the capillary-free zone of the injected retina and the blood-free zone in retinal haemorrhage is sufficiently striking to suggest that the latter is found in those cases where the haemorrhage has taken place from the capillary plexus internal to the inner nuclear layer.

It is outside the scope of this paper to deal with the preparation of the microscopic sections, which follows the usual lines. My purpose has been to point out that much essential information may be hidden in the gap between the ophthalmoscopic examination and the examination of paraffin or celloidin sections; and to show how complete a survey of the normal and abnormal histology of the retina can be obtained by the serial application of the methods described.

REFERENCES

SORSBY, A. (1937).—*Proc. Roy. Soc. Med.*, Section of Ophthalmology, Vol. XXX, Pt. I.
——— (1939).—(*a*) *Brit. Jl. Ophthal.*, Vol. XXIII, p. 20; (*b*) *Trans. Ophthal. Soc. U.K.*, Vol. LXIX, p 727.
ZAMENHOFF (1930).—*Arch. f. Ophthal.*, Vol. CXXIV, p. 87.
GOLDMANN (1938).—*Ophthalmologica*, Vol. XCVI, p. 90.
BEDELL (1937).—*Trans. Ophthal. Soc. U.K.*, Vol. LVII, p. 468.
——— (1939).—*Trans. Ophthal. Soc. U.K.*, Vol. LIX, p. 219.
MICHAELSON and CAMPBELL (1940).—*Trans. Ophthal. Soc. U.K.*, Vol. LX, p. 71.

A CASE OF BOECK'S SARCOIDOSIS

BY

E. V. SRINIVASAN

MYLAPORE, MADRAS

MRS. L., aged 45 years, with cataract in both eyes, with absolutely no contra-indication for immediate operation, had an extraction performed in the left eye, the right eye being quite immature. She was discharged as satisfactory within a month with correction for the operated eye. She returned a month later with signs of cyclitis in the operated eye. After getting the usual treatment for about five months she disappeared without being completely cured, but reappeared in a month's time with pain and marked loss of vision in the eye.

On examination she had well-marked ptosis of the left eyelid. Underneath, the eye was tender with deep keratitis, vascularisation obscuring deeper details as it extended nearly to the upper two-thirds of the cornea. Tension was low. The clear lower cornea

revealed a lot of precipitates. The iris that could be vaguely seen had three or four large rough and irregular reddish-yellow nodules—not of the mutton-fat tubercular type.

What made me think of this case being one of sarcoidosis was the new and additional feature which was not present in the beginning. It was the upper fornix that was full, the skin of the lid having no sulcus between the globe and the superior orbital margin. Palpation detected a hard nodular *tender* mass. This cartilaginous mass could be pushed behind between the globe and the orbital roof having no adhesion to either. Transversely it occupied the mesial three-quarters of the upper fornix having apparently no connection with the lacrymal gland. The posterior limit of the tumour could not be determined though it must be said that it could not be larger than a big almond seed as there was no displacement of the globe and no proptosis. There was no limitation of the eye movements. The fornix conjunctivae had been drawn up by the tumour being adherent to it and could not be seen on everting the lid and making the patient look down severely. The rest of the conjunctiva presented a normal appearance, having no papillae or follicles.

The next feature of still greater confirmatory character was the myxoedematous skin. It was dry and thickened over the cheeks, neck and shoulders, and the upper extremities. The hard and rubbery feel of the skin was something unusual in this otherwise flabby and plethoric individual. The thickness was more or less diffuse in the areas mentioned, though only one solitary circumscribed area of this thickened skin was seen in the outer aspect of the right forearm. The skin of the lower extremities and the rest of the body was normal.

Radiographs of the chest showed enlarged hila with a few calcareous glands, diffuse fibrosis of the lung fields and a few calcified foci. Slight widening of the superior mediastinum towards the right suggested enlarged paratracheal glands. The diaphragm was pulled up on either side as a result of adhesions.

Spleen and liver were normal. There was no enlargement of the lymphatic glands. No history of syphilis or tubercle. Latterly the patient had been having irregular fever. Mantoux test, negative. Biopsy was not done as the tumour was unduly painful in the beginning.

A fortnight of daily general ultra-violet radiation seems to have had distinctly beneficial effect on the tumour, as it showed marked decrease in size, pain having almost disappeared. The cornea was getting clearer and the uveitis improving, though the tension continued to be low. This spontaneous resolution of the tumour characteristic of sarcoidosis made me feel quite indifferent about the biopsy. The tumour is getting harder as it is getting smaller with certainly no sign of softening or caseation.

So far, no case of sarcoidosis has been reported with painful tumours. It is also extremely rare to see a case of mixed sarcoid as mine with uveitis and subconjunctival tumour at the same time. Almost a similar case of Boeck's sarcoidosis of the lacrimal gland has been reported by Stallard, but there was no uveitis. And a number of cases of Boeck's iritis have been published, but not with an orbital tumour in any.

The fortuitous onset of the disease in my patient is rather unfortunate as having occurred after the cataract extraction with which it has no aetiological connection, though I am thankful to the mishap as it brought back the patient with this rare disorder.

Diagnosis.—The question of *Hodgkin's disease* can easily be ruled out as it is a disease of young adult males. No lymphatic glands are enlarged; spleen is normal; no anaemia—except for the recent slight occasional pyrexia, the so-called Pel-Ebstein's fever did not occur at the onset. On the whole there is no appearance of malignancy or impending fatality to suggest the similar reticulo-endothelial disorder. Though radiologically positive, I consider the chest lesions are healed sarcoidosis of the lung.

The only other disease simulating sarcoid is *uveo-parotid fever.* I have not so far seen a case though a lot of literature has been published. In fact sarcoidosis includes very often in its symptomatology Heerfordt's syndrome. The more common generalised glandular involvement, facial paralysis and the initial high fever being absent in my case leaves uveo-parotid fever out of consideration.

Though the slight pyrexia, the roentgenological adenopathy, absence of caseation and the weak or negative Mantoux, common characteristics of sarcoid and uveo-parotid were present in my case, the added subconjunctival tumour, the dermopathy along with the uveitis clinches the diagnosis of sarcoid.

ANNOTATION

Cacoethes Scribendi

It was announced not long ago in the papers that the Minister of Supply wishes to reduce the number of forms which have to be filled in by those firms engaged in war production. Many will hear this news with relief, for form filling is rather a nightmare to most people; and if this concession could be applied to all government forms, including our income-tax returns, it would be welcome. But we must say that will not be an easy matter to manage.

We understand that it is impossible to order a pair of spectacles for a soldier without entering details in quadruplicate. We suppose

that it is not possible to escape this enormous amount of clerical work which falls on the man who tests the vision and is responsible for the actual refraction, but we should have thought that in matters ophthalmological the army authorities might have taken a lesson from Moorfields Hospital, where the details have only to be entered on the out-patient card or in-patient sheet as the case may be, and the prescription filled in on the official form. But it would seem that, in the army, form filling is no new thing. Sir W. H. Russell, the celebrated war correspondent of *The Times* in his book on the British Expeditionary Force in the Crimea (1888) has a good deal to say about it. "Lord Raglan," he writes, "went out to one or other of his divisions every day he could spare from his desk. Perhaps there was no clerk in England who had so much writing to get through, *ipsa manu*, as the Field Marshal in command of the Forces. I believe his Lordship was frequently up till 2 or 3 in the morning, looking over papers, signing documents, preparing orders and despatches, and exhausting his energies in secretary's work. Such a life could with most men afford little opportunity for energy and action. The system that necessitates such labours on the part of the commander in chief must be faulty; it certainly was unsuited for the field and for times of war and was antiquated and cumbrous. The requirements of home authorities obliged the heads of departments to do a great deal of writing. They had to fill up innumerable forms, requisitions, abstracts and returns, and every motion in the House for papers overwhelmed them with fresh matter for pen, ink and paper." Of General Sir James Simpson, we find on page 541, "The general was a victim to writing like his predecessor. He was more a clerk than a general. Now is it the Horse Guards which enforces all this scrivening? If the army cannot be commanded without all these forms and returns let us have in future a writing general and a fighting general."

If Lord Beaverbrook can manage to simplify the herculean task of form filling he will earn the gratitude of everybody.

ANNUAL CONGRESS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM

THE Annual Congress of the Society was held in Trinity College, Cambridge, by courtesy of the Master and Fellows, on Thursday and Friday, September 4 and 5, 1941. Considering the difficulties of arrangement, there was a very good attendance of some eighty members.

In opening the Congress, the President, Mr. R. Affleck Greeves,

expressed gratitude to the Master and Fellows of Trinity and the Provost and Fellows of King's, at which latter College some thirty members stayed; the others were billeted in lodgings. He also thanked the acting Honorary Secretary, Mr. Frank Law, who had undertaken the organisation of the Congress in the absence on service of the two Honorary Secretaries.

The President's paper was on the subject of "Oedema of the Macula," which he discussed in a most interesting manner from many angles. Mr. Neame in his paper on "Dendritic Ulcer and Herpes Simplex," urged extensive research into this subject in order to determine the best treatment and final visual results. Mr. T. Harrison Butler (Past President), in discussing "Migraine," doubted whether headache was often due to ocular defect. The ensuing discussion was largely a relation of personal experience of the malady. The report of the Military Personnel Research Committee of the Medical Research Council was embodied in a paper by Sir John Parsons on "Eye Protection in Warfare," and provoked a lively discussion.

The subject for discussion was "Ocular Injuries Resulting from the War," and was opened by Dr. O. M. Duthie and Professor Zuckerman. More than twenty members contributed to a discussion of considerable interest, in which the vexed question of pure blast injuries was freely debated. Dr. M. D. Thakore described a case of Pterygium, and Mr. O. Gayer Morgan one of Nystagmus Synchronous with the pulse rate. An admirable demonstration of differential staining of the rods and cones, and of cholesterin crystals in celloidin sections, was given by Mr. Eugene Wolff. Mr. Williamson-Noble's paper on Retinal Holes raised the important point of whether operation was indicated in all cases of detachment.

Squadron-Leader Doggart gave an interesting account of experiences and opinions on the subject of war-time service refractions, and Wing-Commander Lyle described very successful results of the operative treatment of post-traumatic diplopia and heterophoria. Mr. Frank Law described a rare case of "Squamous-celled Carcinoma of the Conjunctiva," with histological reports. Mr. Cashell reported a case of "Orbital Angioma," and Mr. Lindsay Rea described the successful treatment of a "Case of Keratitis," by 10 per cent. magnesium sulphate solution.

The Annual General Meeting was held on Thursday, September 4, at 2.30 p.m. The Report of the Council for 1940-41 was read and adopted, and the officers for the ensuing year were elected. *President:* R. Affleck Greeves, M.B.; *Vice-Presidents:* F. A. Juler, W. M. Muirhead, N. Bishop Harman, W. C. Souter; *Hon. Treasurer:* Sir Arnold Lawson, K.B.E.; *Council:* L. H. Savin, Frank W. Law, G. G. Penman, Arnold Sorsby, S. S. Meighan, A. B. Nutt; *Ex-Officio:* Presidents of Affiliated Societies; *Honorary Secretaries:*

J. H. Doggart, E. F. King; *Acting Honorary Secretary:* Frank W. Law.

The Treasurer's Report and Balance Sheet were adopted, and other business conducted. A vote of thanks to the President and Officers was carried with acclamation.

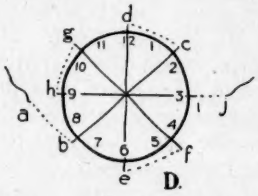
Considering the difficulties of the times, the Congress was adjudged extremely successful, and enjoyed by the eighty members who attended.

ABSTRACTS

MISCELLANEOUS

(1) **Castroviejo, R. (New York).—Keratoplasty. Comments on the technique of corneal transplantation. Source and preservation of donor's material. Report of new instruments.** *Amer. Jl. of Ophthal.*, Vol. XXIV, p. 139, 1941.

(1) **Castroviejo** compares the technique of circular penetrating partial keratoplasty by means of trephines 4·5, 5·5 and 6·5 mm. in diameter with his method of cutting a quadrilateral flap. He describes a method of securing the graft by a single corneal suture placed in the manner illustrated in the diagram below.



D.

He discusses the difficulties and complications of autokeratoplasty, the transplant of clear cornea being taken from adjacent clear cornea and interchanged with the disc containing the corneal opacity in the same eye. The technique of cutting a single disc in these cases and rotating it so that the corneal opacity lies peripherally and the clear part of the cornea centrally has the disadvantage of necessitating the removal of a large disc with the sequelae of anterior synechiae, secondary glaucoma, vascularization and opacification of the transparent area.

The eyes of still-born infants, or those who die shortly after delivery and cadaver's eyes afford sources of donor material when fresh corneal tissue is unavailable. The latter is in the opinion of the author to be preferred. The best method of preservation of the

donor's eye which the author has found to date is in a moist chamber at 2°C. where the enucleated eye is placed immediately after removal.

The eyes of experimental animals examined by the binocular corneal loupe, the slit-lamp and corneal microscope and the ophthalmoscope every 12 hours up to 144 hours showed that at a temperature of 2°C. the anterior segment remained clear and healthy; 24 hours after death the cornea became dull, slightly turbid and 24 hours later lens changes occurred. At room temperature post-mortem changes set in earlier, 8 hours after death. These facts indicate the necessity for using donor material kept at 2°C. within 12 hours after death and 6—8 hours after death when it has been kept at room temperature. The fresher the material the more likely are there to be successful results.

The author considers that the substantia propria of a corneal transplant is not replaced by the tissues of the host.

This is so in the case of the corneal epithelium and endothelium. When a corneal graft remains transparent it retains and preserves its own cellular elements, but any damage to the stroma of the transplant that needs to be repaired by the tissue of the host is at the expense of permanent opacities.

The author describes four elaborate instruments designed to cut a shelving edged graft. These have a device for applying suction to the cornea, and in some the knife or knives are mechanically driven. They are all subject to certain inadequacies.

H. B. STALLARD.

(2) **Postelli and Seidenari (Bologna).—Electro-encephalography in health and disease. (Contributo all'applicazione clinica dell'elettroencefalografia: reperti encefalografici in alcune cerebro- e oftalmopatie).** *Riv. Oto.-Neuro.-Oftal.*, January-February, 1939.

(2) The occurrence of waves from the brain has been known for some time; it is known that these waves differ in health and disease. At present four forms of wave are recognised; they are called alpha, beta, gamma and delta; the first, alpha, are connected with vision; they have a frequency of 8 to 13 a second; the beta waves are connected with touch and have a frequency of 25 a second; the gamma waves are still faster, but are not understood. These all may be found in healthy people. The delta waves are pathological; their frequency is less than 8 a second.

The authors give tracings of a number of cases, some healthy and some in disease; in glaucoma they found a prevalence of slow waves on the side of the glaucoma; a similar result was found in a case of detachment of the retina.

HAROLD GRIMSDALE.

(3) **Martin, L. and Pennell, V. (Cambridge).—A case of exophthalmic ophthalmoplegia.** *Lancet*, Vol. I, p. 39, 1941.

(3) **Martin** and **Pennell** describe a case of exophthalmic ophthalmoplegia in a man, aged 52 years, suffering from moderate thyrotoxicosis in whom ophthalmoplegia with diplopia was an early sign followed later by slight exophthalmos, worse in the right than the left eye. This sequence of events is important for it questions Russell Brain's view that the ophthalmoplegia is largely dependent on exophthalmos.

Upward movement was defective in both eyes, particularly so in the right eye, and abduction was also poor in both eyes. In this case partial thyroidectomy did not increase the exophthalmos.

H. B. STALLARD.

(4) **Bucalossi (Genoa).—Appreciation of polychromatic stimuli (L'apprezzamento degli stimoli policromatici, etc.).** *Ann. d. Ottal.*, February, 1939.

(4) This paper is largely psychological. The author admits that the eye is a very useful organ which has remarkable power of recognising colours, but he points out that it is in some respects inferior to the ear; this latter is able to analyse sensations of sound into the various factors; the eye is incapable of separating the elements which make up compound colours. He holds that it would be no advantage for the eye to do this since it would make the recognition of shapes impossible.

HAROLD GRIMSDALE.

(5) **Schupfer (Florence).—The astigmatic effect of decentration of various types of lenses. (Sull effetto astigmatico da decentrazione di alcuni tipi di lenti da occhiali).** *Boll. d'Ocul.*, April, 1939.

(5) **Schupfer**, from personal clinical observations, suspected the production of astigmatism as the result of decentration of lenses; his researches have confirmed this, when the eye looks through a lens of any form obliquely, but has found that even when the eye looks straight it is considerable in lenses of "Ostwalt" form; it is very slight for meniscus lenses and unnoticeable for periscopic and bi-convex lenses.

HAROLD GRIMSDALE.

(6) **Pergola (Asmara in Eritrea).—A case of "Aleppo Boil" in the pre-lacrimal region. (Su di un caso di "bottone d'Oriente" della regione prelacrimale).** *Rass. Ital. d'Ottal.*, January-February, 1939.

(6) **Pergola** reports this case because of its rarity. The condition had not been diagnosed and the patient had been treated

by cauterisation so that the discovery of the parasite was difficult. The author thinks that the condition may be more common than is usually supposed on this account.

HAROLD GRIMSDALE.

(7) **Loewenstein, Arnold, and Steel, Janet (Glasgow).—Macular burning and ring scotoma.** *Glas. Med. Jl.*, March, 1941.

(7) **Loewenstein** and **Steel** record an interesting case in an intelligent boy, aged 11 years, who looked at the sun for a moment during play and found his sight blurred afterwards. Soon after, at the clinic, his sight was found to be 6/6 in the affected eye, against 6/4 in the other. The authors sum up their findings as follows:—"A boy with right-sided retino-choroiditis juxtapapillaris (Jensen) and its typical resulting comet-like scotoma suffered a macular burning after fixing the sun. The first effect is a slight oedematous swelling. As the vision, according to the statement of the patient and his mother, was intensely blurred after the injury, it seems probable that a central scotoma was present, but not proved.

About three weeks after the injury a sharp clear-cut red patch close under the foveal reflex is seen. Some weeks afterwards a second rather smaller red patch appears upwards and nasally. A third one, about fourteen days later, is less sharply defined and more greyish. In the meantime the red patches receive a thin pigmented frame. Vision of 6/6 against 6/4 in the normal eye remains. A ring scotoma—absolute and negative—is found at the first examination. It disappears in fourteen days, leaving a small absolute blue scotoma at the site of the ring scotoma in the temporal half of the field for a week. Then nothing but the almost unchanging comet-scotoma of the Jensen affection remains. Five months later the two accessory perifoveal patches disappeared and the primary one diminished in size."

The authors discuss previous cases recorded in the literature and the various theories which have been advanced to account for the condition.

Their paper is illustrated by a picture of the fundus, a chart of the right field showing the ring and comet-like scotomata and a diagram to show the positions of the macular patches.

R. R. J.

(8) **Veasey, Clarence A., Jr. (Spokane, Wash.).—Vitamin B in ophthalmology.** *Arch. of Ophthal.*, March, 1941.

(8) Knowledge about vitamins is advancing so rapidly that it is sometimes difficult for the ophthalmic surgeon to keep up with it. **Veasey's** paper is therefore particularly welcome in that it gives a useful account of the components of the vitamin B complex together with ten case reports showing the effects of these substances. At present four factors have been isolated, though at least three others

are presumed to exist. These four comprise thiamine, riboflavin, nicotinic acid, and pyridoxine. Thiamine or vitamin B_1, is a catalyst in the oxidation of carbohydrate, which in its absence is arrested at the pyruvic acid stage, a metabolite which is toxic to nerve tissue and causes peripheral neuritis, but not nerve degeneration. The neuritis is more likely to occur in the presence of noxious substance and thus thiamine deficiency predisposes to such forms of neuritis as those associated with alcoholism, diabetes and the toxaemia of pregnancy. Large doses of thiamine may be useful in tic douloureux and in allergic states. The minimum intake for the average adult is 1 mg. per day, while for optimum health about 5 mg. should be ingested. Doses of 500 mg. or more may be given without untoward symptoms. Riboflavin (vitamin B_2 or G) combines in the body with a protein to form a ferment which is concerned with all respiration; lack of it may cause some forms of keratitis and the swelling of intumescent cataract. The daily requirement is 2—3 mg. Nicotinic acid is the pellagra preventing factor, but deficiency of it can also cause certain psychotic states and photosensitivity, leading to dermatitis from sunlight. The maintenance dose is over 200 mg. per week. Pyridoxine (vitamin B_4) has an unknown rôle in human nutrition though in rats its absence causes a specific dermatitis with loss of hair about the eyes.

In the eye various lesions are attributable to vitamin B deficiencies—oedema of the lids, alopecia and keratoconjunctivitis may be considered as due to riboflavin deficiency when associated with cataract. Styes and phlyctenular disease also fall under this heading and it may be significant that herpetic and interstitial keratitis are improved by riboflavin therapy. In the lens, although there is no convincing clinical evidence of association between riboflavin and cataract, in human beings, lens opacities have been produced in rats by a riboflavin-deficient diet. The optic nerve is rendered more sensitive to other poisons by vitamin B deficiency and cases have been recorded of the cure of tobacco-alcohol amblyopia by parenteral administration of thiamine hydrochloride.

In Nigeria, patients showing a syndrome of reduced vision with photophobia and other symptoms were cured by marmite and autoclaved yeast. Retro-bulbar neuritis may also be improved by these means. Extra-ocular muscle involvement may occur in pellagra, and superior polio-encephalitis may be due to avitaminosis B.

In conclusion, the author advises that administration of one component of the vitamin B complex should be supplemented by administration of the whole complex, that only biologically standardised preparations should be used and in considerable quantity, therapeutic doses being usually multiples of the optimum dose in ordinary life.

F. A. W-N.

BOOK NOTICES

Nutrition in Relation to Eye Conditions. A Symposium. Government of Bengal, Sanitary Board, Nutrition Committee. Quarto, pp. 118. 1940.

This brochure contains the proceedings of a symposium held on July 31, 1940, in Calcutta. It is not printed, but copies seem to have been struck off on a duplicator. Lt.-Col. Kirwan, in a brief preface, insists on the importance of nutrition to the community. A sub-committee of the Bengal Government's Nutrition Committee consisting of clinicians, ophthalmic surgeons, physiologists, biochemists, nutrition workers, food and drug technologists, and industrialists, met to discuss the subject in its various aspects and to suggest practical measures that may have to be adopted for the amelioration of diseases of the eye.

It is common knowledge that there is a very high percentage of blindness in India, and in this respect the census returns probably greatly underestimate the number of blind and partially blind persons. Of the various papers read we note those of Bhaduri, on the influence of malnutrition in diplobacillary blepharo-conjunctivitis, Biswas, on possible nutritional causes of eye diseases other than keratomalacia, Basu and De, on the assessment of vitamin A deficiency by the measurement of visual adaptation, and Sankaran and Ahmad on a simple form of bio-photometer and results of a survey in a jail population. More than half of the booklet is devoted to the discussion of cod and other fish liver oils. There appear to be great possibilities for the production of fish liver oils in Bengal. Sharks abound in the Bay of Bengal and possess very large livers. Bengal not only consumes 40 million maunds of fish annually, but also imports 20,000 maunds of fish oil from other countries. (The maund= 80 lbs.)

Though several species of fish are available, no organised industry for fish liver oil is existing in Bengal today. General methods of extraction, purification and standardisation are here reviewed and conditions in Bengal have been compared with those in Norway. "It is felt that if an organisation on cottage industrial scale is started, Bengal can soon become the Norway of India."

Useful tables of the vitamin content of fish in other countries and the common fish of Bengal are appended, with a table showing the vitamin A content of fish liver oils of India. Resolutions urging the legislature to encourage the production of Indian fish liver oils by various methods were passed, and a small subcommittee of four was appointed to investigate and prepare a statement on the present and the future possibilities of the fish liver oil industry in the province of Bengal.

It is to be hoped that action will soon be taken on the lines of this report.

CORRESPONDENCE

ASCORBIC ACID IN THE TREATMENT OF CORNEAL LESIONS

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIRS—In the communication from us on the treatment of corneal lesions with ascorbic acid published in the June issue of the Journal we stated that the injections used were "Roche" concentrated vitamin "C" ampoules. Through an unfortunate oversight we omitted to say that in a number of cases, "Celin Forte" prepared by the Glaxo Laboratories, Ltd., was employed. With neither product was there any reaction, local or general, and the results obtained were strictly comparable.

We shall be glad if you will permit us to repair this omission.

Yours faithfully,

T. KEITH LYLE,
Wing Commander.

D. W. MCLEAN,
Squadron-Leader, R.A.F.V.R.

August 8, 1941.

HYPEREMESIS GRAVIDARUM

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIRS,—I have read with much interest the paper of Mr. George Black in the September number of the Journal, since it throws further light on the subject of my own paper referred to in your Annotation in the same number.

As Mr. Black states, Campbell and Biggart have shown that Wernicke's syndrome may have many different antecedents, such as chronic alcoholic poisoning, gastric carcinoma, hyperemesis gravidarum, pernicious anaemia, chronic gastritis and others. Investigators have not yet discovered the etiological factor common to all these; but a consideration of the cases of hyperemesis gravidarum suggests that in this condition some form of pregnancy toxaemia causes the persistent vomiting, with loss or destruction of the available vitamin B_1, leading in turn to the characteristic polyneuritis, retrobulbar optic neuritis and cerebral and ocular haemorrhage. A somewhat

similar explanation might apply to the cases of optic neuritis from persistent vomiting after operation, quoted by Wagener and Weir. In this connection also it will be remembered that in some cases of retrobulbar neuritis from tobacco there is a history of chronic alcoholism with gastro-enteritis.

In most of the above mentioned conditions there is either persistent vomiting or a state of the gastro-intestinal tract which would favour the loss or destruction of the ingested vitamins. Which brings us back to the suggestion that Wernicke's syndrome may result from a deficiency of vitamin B_1, combined with some form of toxin. The rapid and striking restoration of vision under vitamin B_1 treatment in Mr. Black's and other cases, strongly emphasises the importance of the vitamin factor in hyperemesis gravidarum, and it appears that this form of treatment may well revolutionise the prognosis in these cases.

I was particularly interested that Mr. Black was impressed with the unusual picture of the retinal haemorrhages without exudates, which I too was inclined to think characteristic of the fundus in advanced cases of hyperemesis gravidarum.

Incidentally, I might mention that Mrs. B., the patient described in my paper, who made a complete recovery after total blindness, was a victim of the air raid of March 14, in which she received severe injuries to the face and both eyes. She came under the care of my friend, Dr. W. J. B. Riddell, who found in her right eye intra-ocular haemorrhages, retinitis proliferans and traumatic cataract, while the left eye had a penetrating wound with prolapse of the iris. The right eye sees no more than "hand movements"; but the left eye, for the second time within twelve months, has recovered normal vision.

Yours faithfully,

A. J. BALLANTYNE.

11, SANDYFORD PLACE,
GLASGOW, C.3.
September 9, 1941.

OBITUARY

JOHN JAMESON EVANS

THE death occurred on August 13, 1941, at Froneithyn, Aberdovey, of John Jameson Evans of Edgbaston, Birmingham. Born in 1871, his early education was at St. David's College School, Lampeter, and Queen Elizabeth's Grammar School, Carmarthen. When he

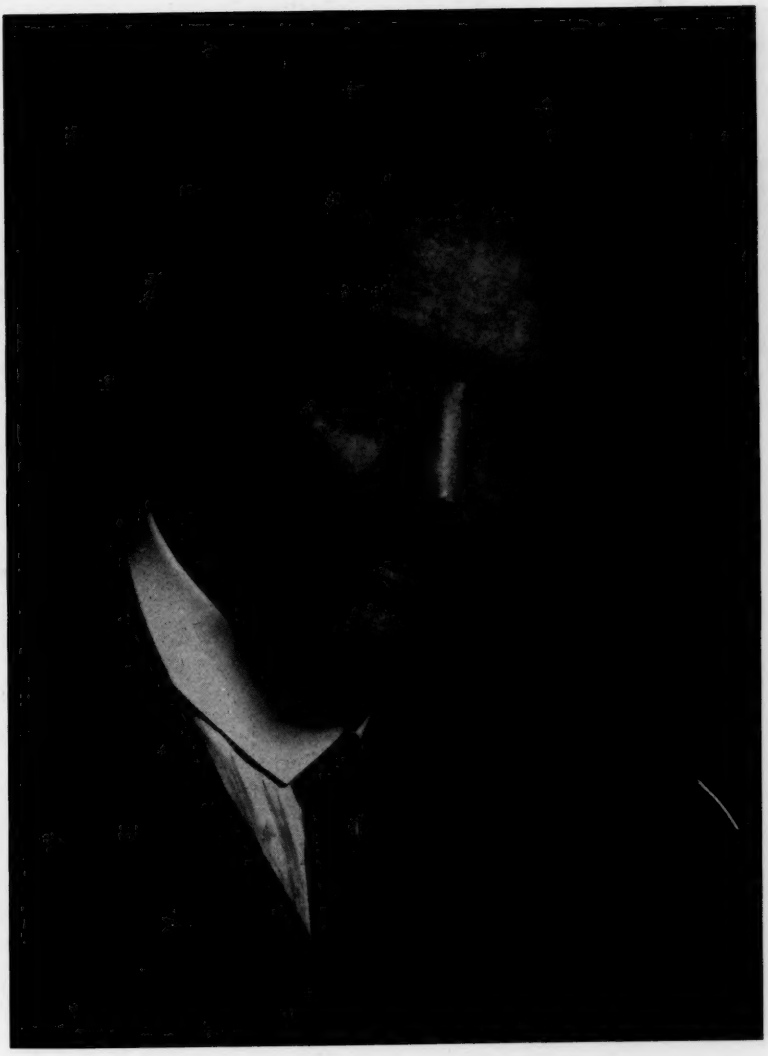
decided on medicine as a career he went to Edinburgh University and graduated in 1892 M.B., C.M. with honours. In 1899 he became F.R.C.S. England, and in 1903 M.D. Birmingham.

After qualification Mr. Jameson Evans spent three years at the Carmarthen County Infirmary and then went to Birmingham where, after three years, he was appointed Honorary Ophthalmic Surgeon to the Birmingham & Midland Eye Hospital and continued to serve in that capacity till 1934 when he became Consulting Surgeon. In addition he was Consulting Ophthalmic Surgeon to Birmingham General Dispensary and Ophthalmic Surgeon to Hallam Hospital, West Bromwich, for many years: he was also Honorary Ophthalmic Surgeon to the Birmingham Royal Institution for the Blind. On different occasions he was President of the Midland Medical Society; of the Birmingham branch of the British Medical Association, and of the Midland Ophthalmological Society; and Vice-President of the ophthalmic section of the British Medical Association, and of the Ophthalmological Society of the United Kingdom. He served on the council of the Oxford Ophthalmological Congress, of which he was a foundation member, for nineteen years, and held the position of Lecturer in Ophthalmology in the University of Birmingham for twenty-five years. He was Middlemore Lecturer on several occasions and his numerous publications covered a wide range of ophthalmic and related subjects.

Mr. Jameson Evans leaves a widow, the second daughter of the late Principal Edwards, of Aberystwyth, and two sons, both of whom are engaged in medical practice.

Mr. Harrison Butler writes—

I first met Jameson Evans in 1907 when I started work in Coventry. That was the beginning of an association which ended only with his death. When I joined the Honorary Staff of the Birmingham Eye Hospital in 1913 it was my good fortune to sit on the same days as Jameson Evans, and for eighteen years we worked at neighbouring desks, becoming intimately acquainted with each other's cases, and rendering mutual help. The longer I worked with Evans the more I appreciated his worth both as a man and as an ophthalmologist. During this long period, which included the arduous times of the last war, we never had the slightest disagreement, and his sunny nature created a genial atmosphere that made our mornings at the hospital happier both for the staff and the patients. His treatment of his hospital cases was an example to all. Never once did I hear him say an unkind or even rough word to any of them, always there was a kind word and encouraging smile, or a pleasant witticism. Professionally, to work with him was an



JOHN JAMESON EVANS

inspiration. His knowledge of ocular disease was far reaching and his opinion on a case almost final. His ophthalmoscopy was superb, and pathology to him was a hobby. For many years he had undertaken all the pathological work of the hospital, and I am sure that he loved this side of the work of the hospital above all. For many years he held the office of Reader in Ophthalmology to the University of Birmingham, following Priestley Smith, who was Professor of Ophthalmology. He brought out a useful little brochure embodying the essential features of his teaching.

Jameson Evans had a large circle of friends, and his intimates in the profession called him "Sunny Jim," an epithet which exactly described his nature. All of us feel that we have lost for the time being a good friend, a valuable mentor, and an outstanding example for all to imitate.

Jameson Evans' hobby was golf, and a fortnight before his death he completed two rounds on the links at Aberdovey, perhaps too much for a man of 70. He had, only a few months before the end, retired to his country cottage by the sea to nurse his wife who had become an invalid, and to be with her as much as possible. As things turned out his retirement from an arduous practice was short, and our sympathies go out to Mrs. Jameson Evans and her two sons, one of whom, Philip, carries on his father's work as Assistant Surgeon to the Birmingham Eye Hospital.

We have also received the following appreciation from an old friend who wishes to remain anonymous.

To his many friends, professional and private, the passing of J. Jameson Evans is a grievous blow. The character of his personality united a wide and simple human sympathy with a helpfulness that created an abiding impression on all who came in contact with him.

He made numerous and valuable contributions to ophthalmic literature and but for the war, he would have opened the discussion at the postponed Oxford Ophthalmological Congress of 1940, on the subject of the prevention of operative complications following extraction of cataract.

As a lecturer Jameson Evans was a master of concise and pregnant exposition and his wide range of culture, his quickness of mind and his abundant human vitality and wit made him a teacher of unusual power. At the same time he was never happier than at his home and on the links at Aberdovey. The deepest sympathy of all his friends is extended to his widow and two sons.

NOTES

BRITISH JOURNAL OF OPHTHALMOLOGY

Increase in Subscription Rates in 1942

WE regret to have to inform subscribers that it has been found necessary to increase the price of the Journal from January 1, 1942, to £3 3. 0 per annum, or 6/- per number.

As will be easily understood, this increase has been necessitated by the rise in the cost of every single item of expenditure, paper, printing and distribution, in some instances up to double the pre-war cost.

The management will make every effort to keep the Journal up to its present high standard both in quality and quantity, and hopes it may rely on its subscribers to provide the necessary funds to make this possible.

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Post-graduate Lectures in Ophthalmology. University of Glasgow

A SERIES of eight Post-graduate Meetings will be held in the Tennent Institute of Ophthalmology on Wednesdays, from September 10 to October 29, at 8 p.m.

The subjects of the addresses will include:—Post-graduate tuition in Ophthalmology, the making of the Ophthalmic specialist, Ophthalmic practice in retrospect, the future of Ophthalmic practice, Pros. and cons. in Ophthalmic Therapeutics, Ophthalmology in the law courts, and the problem of the nearly blind.

There will be opportunity for informal discussion.

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Post-graduate course in Ophthalmology at Oxford.

The course of post-graduate lectures in ophthalmology and allied subjects will be held in the University of Oxford for the Diploma in Ophthalmology during the Michaelmas Term 1941, beginning on October 13 and ending on December 5. The scope of the course has been enlarged by including lectures on medical subjects allied to ophthalmology. The fee for the course is £15. Clinical work in conjunction with the lectures is available at the Oxford Eye Hospital, and full particulars can be obtained from the Reader in Ophthalmology. We regret that lack of space prevents us from printing the complete details of the course which is an exceedingly comprehensive one.

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Insurance of spectacles and instruments.

Ophthalmic surgeons are reminded that spectacles and other instruments can be insured against loss or damage from the time of purchase. In respect of spectacles all members of the Association of Dispensing Opticians issue certificates to this effect if desired.